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MASON B. THOMAS
SAMUEL J. RECORD

THE HARDY CATALPA

BY

SAMUEL J. RECORD, M. A.

IN CHARGE OF FORESTRY



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1906

Monograph

INDEX

INTRODUCTION

THE TREE

- Distribution and History**
- Comparison with Inferior Species**
- Manner and Rate of Growth**
- Soil, Light and Moisture Requirements**
- Character of Wood**
- Uses of the Timber**
- Diseases and their Prevention**

THE NURSERY

- Securing the Seed**
- Soil and Site**
- Seeding**
- Caring for the Stock**

THE PLANTATION

- Preparation of Soil**
- Spacing and Planting**
- Tending and Pruning**
- Thinning**
- The Final Crop**
- Probable Returns**

CONCLUSION

5 II 397
C 35 RA



Typical Indiana *Catalpa speciosa*

BY J. P. BROWN

THE HARDY CATALPA

INTRODUCTION

Much has been written about the hardy catalpa; so much in fact that further literature may seem superfluous. Many statements however, do not harmonize and even the best recognized authorities have failed to agree in all particulars. Unfortunately, also, there has been much confusion of species and hybrids which has lead to misunderstandings and false conclusions.

The purpose of this bulletin is to aid in clearing up this confusion, to glean the wheat from the chaff. It is inspired by the universal request for definite and positive information concerning this tree, its uses, culture and value.

Tree planting for commercial purposes is new to most Americans. It is not until the forests are almost exhausted that any serious attention is given to the timber supply. And even with a timber famine imminent, few people are willing to plant trees which will require a lifetime for maturity. Forest growing must be made to pay else the private individual cannot afford to engage in it.

The hardy catalpa has many properties which make it valuable as a farm crop. It grows very rapidly, becomes merchantable as soon as large enough for posts, and regenerates itself readily from sprouts. For quick returns it has few equals, while its general immunity from disease and the lasting qualities of the wood give it high rank commercially.

Farmers are everywhere becoming interested in the growth of this tree and thousands of plantations have been started. Many of these have been failures and many more only partially successful. In nearly every instance the trouble may be traced to lack of information. Either the wrong species were used, or the trees were planted too closely or on sterile soil, or were not given proper cultivation. These failures have done untold injury to the popularity of the hardy catalpa and have filled the minds of many prospective planters with doubt and hesitancy.

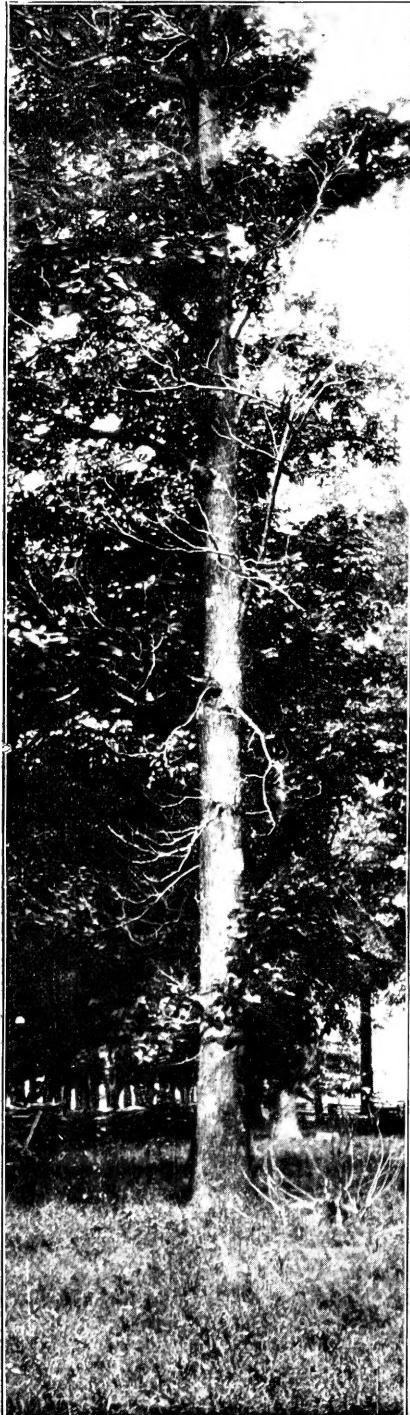
Hence there seems a need of a publication which will present the facts without prejudice or partiality; that will state simply and clearly the essential points in the cultivation of this tree; and that may serve as a safe and practical guide to tree planters. To these ends the author has striven and has spared no pains to secure the truth.

THE TREE

Distribution and History

The hardy catalpa (*Catalpa speciosa*) is indigenous to the lower Wabash and Ohio River valleys where it originally existed as isolated individuals or in scattered clumps among the other trees of the forest. It frequently attained large size, over four feet in diameter and 100 feet high, while there are records of trees which measured twenty-one feet in girth with a corresponding height of nearly 150 feet. Most of these giants have disappeared to furnish fence rails, posts and cross ties, as the early settlers were quick to learn its value. There are a few specimens of forest growth still to be found in southern Indiana and lower Illinois.

From its very limited natural distribution the tree has since been introduced into nearly every part of the United States and also into many foreign countries. It is being widely planted by farmers for posts and by railroad companies for cross ties and telegraph poles. Many nursery firms make a specialty of this tree and various companies make it a business to establish plantations and care for them. At least two States are actively engaged in distributing seedlings to landowners and encouraging plantations. By various other means the range of this tree is being extended and its propagation encouraged. Throughout the Middle West, especially, the popularity of the hardy catalpa is unrivaled and many trees are being planted every year.

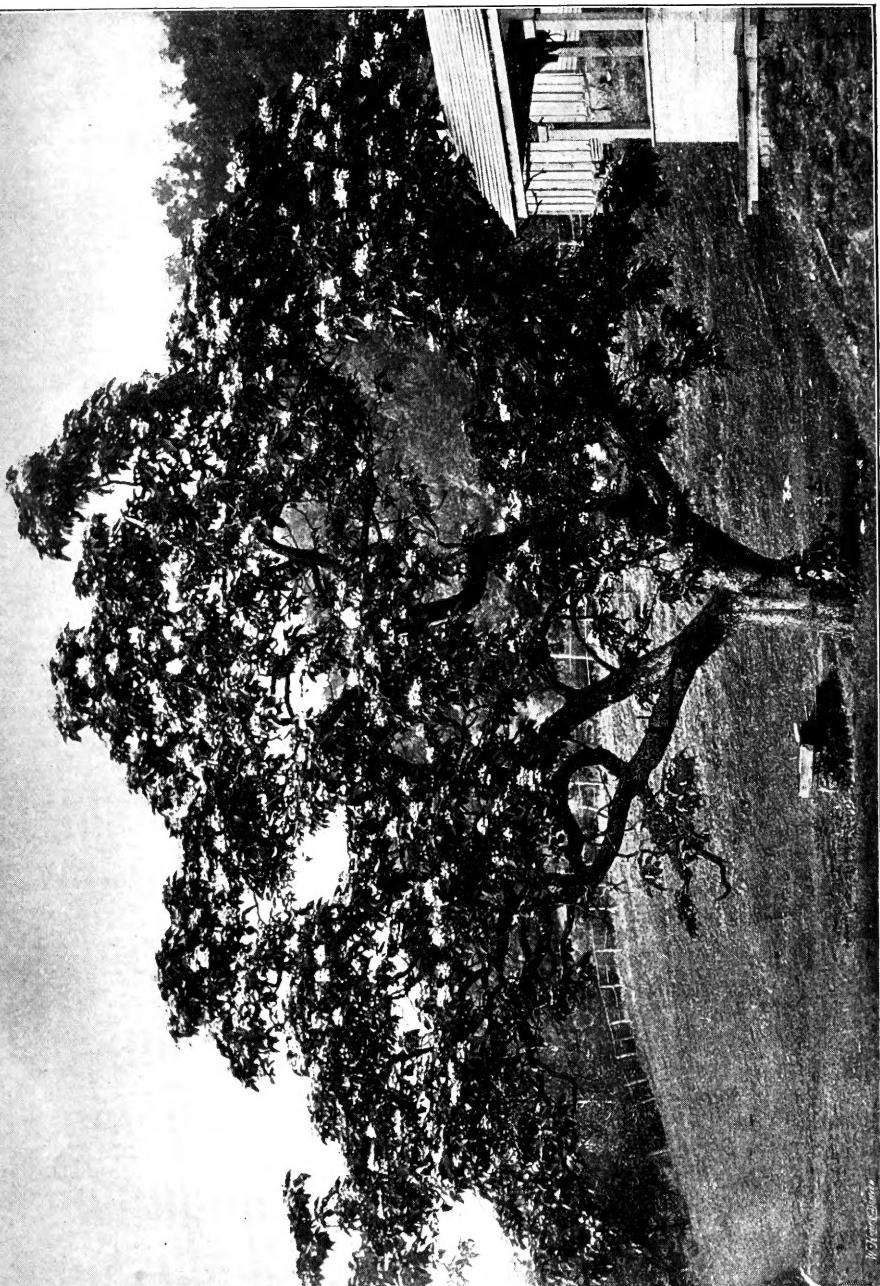


Catalpa speciosa from the Wabash Valley

BY J. P. BROWN

Catalpa catalpa. Commonly confused with *Catalpa speciosa*

BY J. P. BROWN



Comparison with Inferior Species

There are three species of the catalpa which have been widely distributed in the United States. They are *Catalpa speciosa* or hardy catalpa; *Catalpa catalpa* (*Catalpa bignonioides*) or southern catalpa; and *Calpata kempferii* or Japanese catalpa. The first two are indigenous to this country, while the last is an importation. These species hybridize readily through the agency of insects which produce cross-fertilization. All of the hybrids are inferior to the *Catalpa speciosa* which is the only form desirable to plant.

Although the botanist can readily distinguish the forms it is usually difficult for the layman. To assist the latter some of the distinguishing characters are given. The principal points for comparison are flowers, fruit, bark, and habit of growth.

To the ordinary observer the flowers of all of the forms look very much alike, but in reality those of the *C. speciosa* are considerably larger, and have a wider border of white which makes them appear less highly colored. They also begin to appear from one to two weeks before the others in the same locality. The flowers of the pure *Catalpa kempferii* have a distinct yellowish tint which makes them easily recognized. However, since the trees are in bloom only a short time each year, their floral characters become less important.

The fruit of the catalpa is a long, slender, cylindrical pod containing a large number of long, flat, papery seeds with frayed ends. The pods of the hardy catalpa are much larger than the others, being from fourteen to eighteen inches in length and about three-fourths of an inch in diameter. Moreover there are usually a small number to each tree and only one to three to each flower cluster. The southern catalpa produces an abundance of pods, six to eight inches long, one-half inch thick and in clusters of from four to six. The pure Japanese species has much smaller pods in numerous clusters of from eight to twenty each.

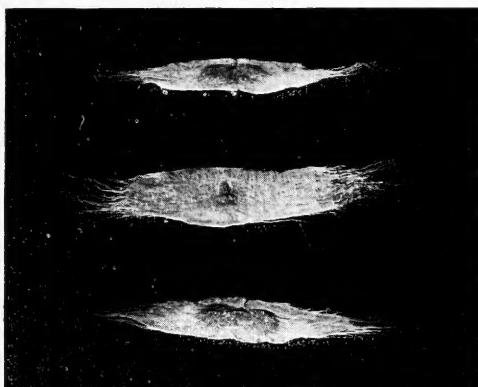
There are corresponding differences in the seeds. Those of the hardy catalpa are larger, heavier and broader than the others. The silky filaments at the ends are in broad pencils instead of being drawn to a point and frequently twisted as in the others. About 100 pods of *Catalpa speciosa* are required to furnish one pound of seed. The seeds are twice as heavy as those of *Catalpa catalpa* and four times heavier than the seeds of the oriental species. The accompanying cut shows a comparative view of the three kinds.

The bark of the catalpas is distinctive, especially on the mature trees. That of *Catalpa speciosa* is thick and heavy with deep furrows and prominent ridges. It is usually possible to determine the age of a tree with reasonable accuracy by counting the annual rings in the bark. In the other species it is flaky, scales off readily, and does not form ridges. These characters are not so noticeable in young trees.

Probably the most distinguishing character of all is the habit of growth. Seed for planting should be collected only from straight upright trees over twenty feet in height. The Japanese catalpa grows

fairly straight but seldom attains a height of more than twenty feet. The southern species produces a short, spreading and irregular tree undesirable for propagation. (See illustration.)

In the many hybrids the characters are not so pronounced as in the pure breeds, and it is sometimes very difficult to distinguish the



Seed of Catalpa. Top seed *Catalpa kempferii*
Middle seed *Catalpa speciosa*
Bottom seed *Catalpa catalpa*
BY P. J. BROWN

forms. In any particular case all of the above tests should be applied, and failure to meet any of the requirements should be disqualifying. "When in doubt, reject," may be taken as a good motto in selecting catalpa seed or plant material.

Manner and Rate of Growth

The hardy catalpa is usually a very rapid grower. The best development is made on deep, rich, moist soil in unrestricted sunlight. The form of the tree is upright with a gradually tapering stem covered with side branches almost to the ground. On poor soil the trees are low, crooked and much branched.

The terminal bud of the young catalpa is often winter-killed and continued growth in length must be from the first lateral bud. This accounts for the tendency to crookedness which is commonly observed, to some extent at least, in all catalpa trees.

When grown in plantations the trunks have less taper and the height is greater in proportion to the diameter. The lower branches readily die in the absence of sufficient light but will persist on the tree for many years.

The root system is very extensive. There is usually a stout taproot with many laterals. It is mainly upon the ability of this root sys-

tem to develop rapidly and extensively in all directions that the successful growth of the tree depends.

Rate of growth in diameter and height depends always upon local conditions. Height development bears the closest relation to the quality of the locality. The increase is most rapid in youth and becomes gradually less as the tree matures. An average annual increase of three feet may be expected for the first ten years under fair conditions.

Increase in diameter is greatest in trees growing in good soil in the open. The crowding of trees in a plantation may tend to induce height growth but always at the expense of diameter. Trees growing in the most favorable situations frequently add one inch annually to the diameter of their trunks. In a plantation, however, not more than half this rate should be expected.

Soil, Light, and Moisture Requirements

The catalpa cannot be grown with success on poor soil. This has been clearly demonstrated by some of the largest plantations in the United States. A good object lesson is afforded by a plantation in Crawford county, Kansas, established over twenty-five years ago by the Kansas City, Fort Scott and Memphis Railroad Company. In this forest the returns on the best soil were almost five times as great as on the poorest. In another well-authenticated instance, a plantation which showed great variation in soil fertility, gave no return on poor sandy soil, while on rich loam it yielded a clear annual profit of more than twenty dollars per acre.

The soil should be deep, as the presence of an impervious subsoil seriously interferes with the development of a good root system without which the tree can make little growth. In general, soil which is capable of producing good crops of corn or wheat is best adapted to catalpa culture. Bottom land is especially suitable if sufficiently drained. An occasional flooding from a swollen stream will seldom occasion any considerable damage to the trees.

The tree demands a large amount of direct sunlight. No development can be expected in the shade of other trees. For this reason catalpa should never be planted with other species which may later overtop it, or in small openings in natural forests.

In many of its requirements the catalpa resembles the black walnut and may be depended on to do well in situations suitable to the latter. The soil should be moist, but not continually wet. Cold muck lands or undrained kettle holes are not desirable sites. Sandy soil with sufficient humus to retain moisture is suitable.

Character of the Wood

In general appearance, weight and texture the catalpa wood resembles very closely that of the butternut. It is light, porous, dark brown in color, and capable of taking a high polish. After being cut from the living tree it is one of the most durable timbers known. It resists weathering influences and attacks of wood-destroying fungi to an

exceptional degree, thus adapting it especially for use in contact with the ground.

The wood is quite tough, though rather soft and light. Second-growth timber, however, is harder than slower growing old trees from the virgin forest.

The sap-wood of the catalpa does not greatly resist decay when used in contact with the ground, a fact true of all timbers. The heart-wood, however, forms nearly three-fourths of the volume of the entire tree, even at the early age of five or ten years, and its durability is not apparently affected by age or rapidity of growth. The problem for the owner, therefore, will be to secure the best growth and the most perfect form in the least time.

Timber for posts, ties or poles should be cut during the late fall and winter, as the water content of the tree is then at its lowest point. The wood should be allowed to season before using.

Uses of the Timber

The catalpa makes an ideal post timber and it is for this purpose that most plantations have been started. In view of the fact that it can be grown so easily, farmers everywhere can with profit devote a portion of their land to its culture.

Whenever trees can be grown tall and straight enough they will make most excellent telegraph and telephone poles, outlasting any other class of timber.

The wood has been used for cross ties by several railroads and there is no doubt about its durability. There is only one serious objection to the wood for this purpose, that is its insufficient hardness. With very heavy traffic this becomes a serious matter. It is quite probable that the proper use of tie plates will do much to remedy this difficulty.

Various experiments have been made with the wood to show its general adaptability. It has a handsome grain and polishes readily, making it desirable for furniture and interior furnishing. The very limited supply of the timber has prevented its general use for such purposes.

Diseases and their Prevention

The catalpa is seldom attacked by any destructive diseases. Occasionally the leaves are eaten by caterpillars or are the hosts for a number of parasitic fungi, but no great permanent injury results. The young twigs and the roots are free from disease so far as known. There are two forms of rot which sometimes destroy the wood of the trunk and do considerable harm, but it is usually easy to prevent their attacks. One is a soft rot, the other a brown rot, both caused by fungi. Both diseases gain entrance to the heart-wood through wounds or holes left by decaying limbs. Trees so attacked seldom show any outward sign of the disease and it is only when they are cut or blown over that the damage becomes apparent. The wood becomes soft and brittle, and is finally completely rotted, rendering the trees valueless.

It is highly desirable that the trees be kept healthy, since one diseased tree may infect the entire plantation. To prevent the decay of the trunks it will be necessary to prevent the entrance of the fungus spores. This can be readily accomplished by preventing the growth of side branches or removing them before they are allowed to die. If large branches are cut off the wound should be coated with ordinary coal tar which penetrates deeply into the wood and acts as a powerful antiseptic.

THE NURSERY

It is cheaper for the planter to grow his own trees from seed than to buy them from a nursery, especially if large numbers are to be planted. Seedlings can be grown readily for about \$1.50 per thousand, while the market price for the same material is from \$5 to \$20 per thousand. Such differences in initial cost will count up immensely on the final profits. It is essential to reduce the first cost of forest planting to the least possible amount.

Another consideration still more important than the initial cost is the liability of securing nursery stock of inferior species or hybrids. Many thousands of trees and many hundreds of pounds of seeds of almost worthless kinds have been sold and distributed by dealers as the genuine hardy catalpa. For this reason innumerable plantations have failed, thus causing the owners loss and creating an wholly erroneous impression of the hardy catalpa.

Securing the Seed

The utmost caution should be used to secure pure seed of the *Catalpa speciosa*. If gathered by the planter it should be only from trees of undoubted identity situated at considerable distance from any tree of the inferior species. The seed should be collected in the fall and stored in a dry, cold place over winter.

In purchasing seed from dealers the same caution must be used. Of samples recently secured from all the important tree seed dealers in the United States, fully eighty per cent were not true to name. For this reason, when seed is purchased it should be examined by an authority and positively identified before planting.

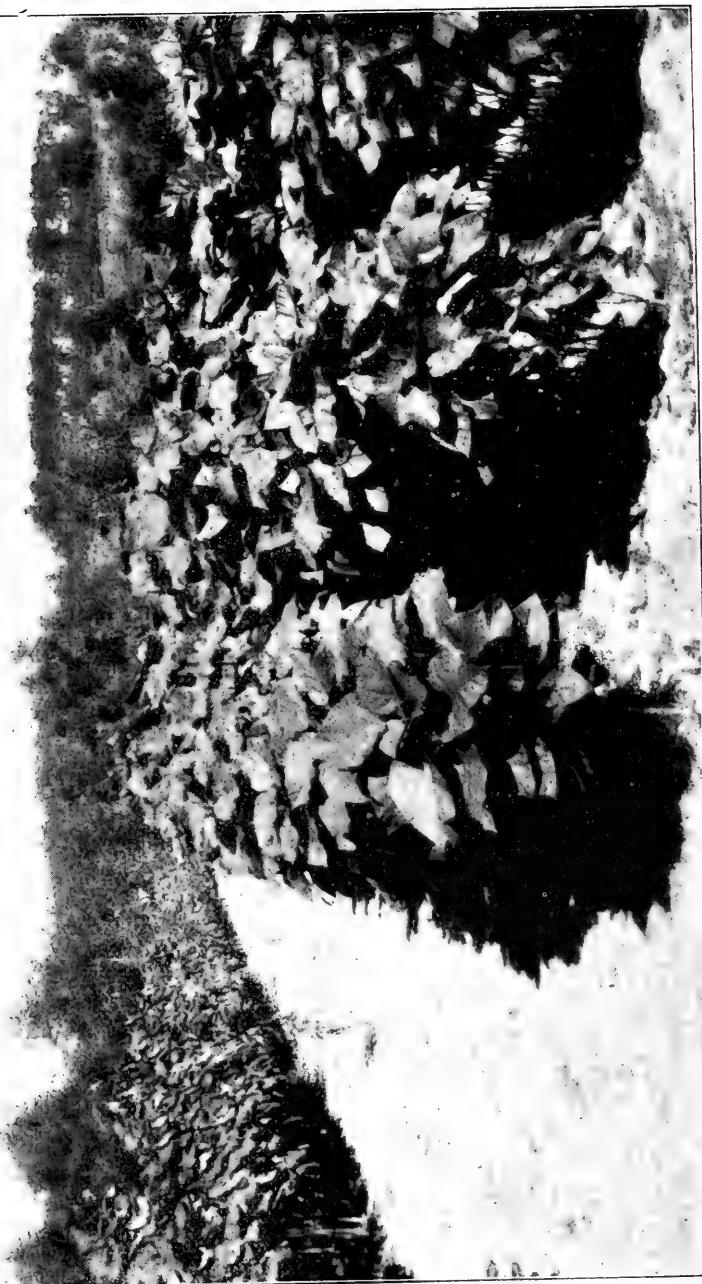
To this end the services of the United States Department of Agriculture may be secured for the asking. All that is necessary is to enclose a sample of the seed in an envelope with a request for its identification and mail to

THE FORESTER

U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Soil and Site

Preferably the soil should be a deep sandy loam of moderate richness. If the soil is naturally poor it should be enriched with well-rotted manure. Good drainage should be assured.



Catalpa Nursery, St. Leo, Fla.
BY J. P. BROWN

For growing trees for the ordinary farm wood lot a portion of a well-worked field or garden may be readily employed. It is usually better to have the nursery located near the house on account of the convenience in cultivation. Arrangements should be made so that the seedlings may be watered in case of prolonged drouth.

Seeding

The seed should be sown in rows three and one-half feet apart, if a horse cultivator is to be used, or two feet apart if cultivated by hand. Since not all of the seeds planted may be expected to grow, they should be sown more thickly than they are wanted to stand in the row. A good plan is to strew them along in the furrows about twenty-five to the foot. A pound contains over 10,000 hardy catalpa seeds which will cover approximately 400 linear feet of seed drill.

The seed should be sown in the spring after danger of heavy frosts are over and covered with well-pulverized soil to a depth of not more than one-fourth inch. Many failures are due to planting too deeply. The earth over the seed row should then be firmed by gently tapping with the back of a hoe or pressed with a board.

Caring for the Stock

Until the seedlings have formed the second pair of leaves they are very delicate, and special care should be exercised to keep the ground mellow and free from weeds and grass. Clean, level cultivation should be continued throughout the season.

By autumn the plants should have reached a height of from two to four feet, an ideal size for forest planting. After the leaves have fallen but previous to any heavy freeze, the trees should be carefully dug up and placed in the ground for protection during the winter. This temporary storing or heeling in, consists in planting dense slanting rows of seedlings in a trench. Almost the entire tree should be covered with a thick layer of straw or leaves held down by branches or poles. This will prevent the killing back of the young and tender shoots.

If for any reason all of the stock is not used the first season it should be transplanted into nursery rows three feet apart and six inches apart in the rows. The transplanting produces vigorous root development and such plants, therefore, establish themselves better when permanently set out. The advantage gained is not sufficient in most cases to warrant the extra trouble and expense of transplanting all of the stock into the nursery.

THE PLANTATION

Preparation of the Soil

Whenever possible the ground should be plowed deeply and thoroughly worked before planting. It is a good plan to prepare the soil "as for corn or vegetables, as indeed these crops are frequently grown be-

tween the rows of the young trees. Sod land should be plowed in the fall and allowed to lie fallow until spring.

If the ground is very wet or mucky it should be drained before planting. Trees should never be set in sod, on steep hillsides, or in small openings in a forest.

Spacing and Planting

The most satisfactory spacing for trees in a plantation is six feet by six feet. This requires 1,210 trees per acre. Closer planting is to be avoided as it will only result in stunting the growth of the trees. On poorer soil, planting six feet by seven feet (about 1,000 trees per acre) will give them better opportunity for development. If the spacing be too wide the plantation will require too much care to prevent the growth of side branches and a choking undergrowth of weeds and grass.

Early in spring the thoroughly worked soil should be furrowed out deeply into rows six or seven feet apart. In these rows the trees should be dropped at intervals of six feet and immediately covered with earth to a depth slightly exceeding that in the nursery. The soil should then be packed very firmly about the roots with the foot.

The most favorable time to plant is on a damp, cloudy day, when the soil is moist but not too wet. The roots of the trees should be kept covered to prevent drying out. This is readily done by spreading a piece of wet carpet over them or covering with earth. If the soil is a little dry the seedling roots should be dipped in a mud bath.

The easiest way to prepare the latter is to partially fill a half-barrel or large bucket with water and stir in light, loamy earth or muck until a rather thin puddle is formed. Grasp a bunch of seedlings firmly and plunge the roots down into the mixture, sousing them several times to coat them thoroughly. The seedlings are then ready for transplanting. A basket is convenient for carrying the plants along the rows where, one by one, they are dropped in place.

Tending and Pruning.

A plantation will require cultivation for the first two or three years. Some crop such as corn, beans, peas or potatoes, may be grown between the rows the first year and the returns from this source will more than repay the cost of cultivating.

During the second and third years, only the surface of the soil should be stirred, otherwise the roots will be injured. Two or three cultivations will be sufficient to keep down the weeds and grass. If a sod is allowed to form it will choke and rob the trees and interfere seriously with their development.

For the first two years after planting, the trees should be allowed to grow and develop a strong root system regardless of the shape of their crowns. Late the second winter all trees that have not a single upright shoot, should be cut off close to the ground. This can be done with heavy pruning shears, a saw or a sharp ax. When the ax is used it should be with a swinging upward stroke as a downward stroke will split the trunk.

As soon as the sprouts are about a foot high, all should be broken off except one of the most vigorous on each stump, and if possible, it should be on the side toward the prevailing wind, usually southwest. This work should be done carefully so as not to disturb the bark. It is also a good plan to bank earth about the sprouts to depth of five or six inches to lessen the danger of them being blown over by the wind and to prevent the growth of others.

These sprouts will make very rapid growth during the summer and soon equal and possibly outgrow the trees which were not cut back. The main advantage is the obtaining of a straight branchless growth without the trouble or expense of pruning. Should the trees become top heavy some of the limbs must be removed. If a tree be badly injured or broken by storm or otherwise, it should be cut off at the ground and allowed to renew itself at the stump.

Care should be taken to see that a single upright leader is not interfered with by too many side branches. They should be removed to a height of sixteen feet before they reach a diameter of more than one-half inch. The best instrument for this purpose is a wide, sharp chisel upon the end of a long handle. An upward thrust or a slight blow with a mallet, is sufficient to remove the limb. It is important that the branches be removed close to the trunk of the trees, without so much as a quarter inch of stub remaining. If done properly, the wound will soon callous over and prevent the entrance of disease spores.

Thinning

Under ordinary circumstances trees should be large enough for posts in about ten years. About this time there will be a noticeable decrease in the rate of growth, due to the close crowding. The trees begin to contend with each other for food and growing space, and energy is wasted which should be conserved in the form of wood.

If only posts are wanted, all of the tract may be cut clear and allowed to reproduce itself by sprouts from the stumps. If larger timber be desired, only half of the trees should be removed, leaving the others to continue growing. A thinning tends to stimulate the growth of the remaining trees. It may be readily done by removing all the trees in each alternate row, or every other tree in each row. In about five years another thinning will be necessary, if very large trees are desired for a final stand.

The Final Crop

The time required to produce merchantable material depends on the nature of the product desired. The trees should be large enough for posts in from eight to twelve years, depending on the quality of the locality. Larger timber will require a proportionately longer time.

The growing of posts will appeal most strongly to the farmer since large quantities of them are needed annually. The catalpa is especially adapted to this purpose and will yield good results in a short time. Once a plantation is established it is self generating, for the stumps sprout

very readily. In felling the trees the stumps should be cut very low and afterward trimmed up smoothly with an ax to improve their sprouting capacity.

Probable Returns

It is manifestly impossible to foretell the results of any forest plantation. So much depends upon local considerations than an attempt to estimate returns is apt to be misleading. Many extravagant claims are made by enthusiasts which are scarcely justifiable. Making due allowances, however, the fact still remains that the hardy catalpa is desirable for propagation and has been grown with profit.

Better than forecasting is a statement of what has been done in actual practice. One compartment of the Yaggy plantation in Kansas has given a clear profit of over \$21.00 per acre annually, for twelve years. In the Farlington, (Kansas,) plantation the average yearly profit on 400 acres for twenty-one years, was \$12.65 per acre, though the returns on the best land in the plantation were \$30.00. In Ohio, estimates of eight catalpa groves twenty-one to twenty-five years old, none of which had received careful attention in the way of pruning, cultivating or thinning, and most of which had been planted too closely, show an average yield of 2,777 posts per acre valued at \$240.00. It seems safe to assert that with proper care the returns from these groves could have been increased three-fold.

CONCLUSION.

In the foregoing the principal points for consideration are:

1. That the wood of the hardy catalpa has many valuable properties and is especially desirable for posts.
2. That of the numerous species and hybrids of the catalpa only the pure *Catalpa speciosa* should be planted.
3. That only good soil is adapted to its culture.
4. That it is much cheaper to grow the seedlings than to purchase them from dealers.
5. That close crowding of the trees in a plantation is to be avoided.
6. That hand pruning will be necessary to produce clear, straight and sound timber.
7. That the growing of hardy catalpa may be made a safe and profitable investment.

It must not be concluded however, that the *Catalpa speciosa* is the only tree desirable for cultivation. In less favorable situations the black locust is superior to it, while on fair soil the mulberry and Osage orange can be grown very successfully for posts. Neither should the propagation of these trees preclude the planting of the more valuable though slower maturing species, such as black walnut, white oak, white ash, tulip-tree, bass-wood, hickory and sugar maple.



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